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TOWNSEND and TOWNSEND and CREW LLP

By: [signature]

PATENT
Attorney Docket No. 018563-002920US
Client Ref. No. 9032.ALG.XC1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No. 4730
PAVLOVSKAIA, ELENA et al.	Examiner: MANAHAN, TODD E.
Application No.: 10/633,015	Technology Center/Art Unit: 3732
Filed: July 31, 2003	APPELLANTS' BRIEF UNDER 37 CFR §41.37
For: SYSTEMS AND METHODS FOR REMOVING GINGIVA FROM COMPUTER TOOTH MODELS	

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Further to the Notice of Appeal mailed on January 16, 2007 for the above-referenced application, Appellants submit this Brief on Appeal. Appendix A, attached hereto, contains a copy of all claims pending in this case. Appendix B, attached hereto, is marked as the evidence appendix. Appendix C, attached hereto, is marked as the related proceeding appendix.

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1. REAL PARTY IN INTEREST

All right, title, and interest in the subject invention and application is assigned to Align Technology, Inc., having offices at 851 Martin Avenue, Santa Clara, California 95050. Therefore, Align Technology, Inc. is the real party in interest.

2. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known which will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

3. STATUS OF CLAIMS

Claims 1-31 are currently pending. Claims 32-36 have been canceled. Currently pending claims 1-31 stand rejected under 35 U.S.C. §102(e) and are the subject of this appeal. No other claims are pending.

4. STATUS OF AMENDMENTS

A Final Office Action was mailed on September 13, 2006, in which claims 1-36 were rejected under 35 U.S.C. §102(e). A 37 C.F.R. § 1.116 after final amendment in reply was filed on November 13, 2006, amending claims 1, 21-24, and 26 and canceling claims 32-36. An Advisory Action was mailed December 5, 2006, entering the after final amendments. A Notice of Appeal was filed on January 16, 2007.

A copy of all the pending claims involved in the appeal is provided in Appendix A, attached hereto.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates generally to the field of orthodontics and, more particularly, to computer-automated separation of a model of teeth. U.S. Application No. 10/633,015, filed July 31, 2003 (hereafter "Application"), page 1, lines 11-12. In one aspect, the invention includes computer-implemented techniques, methods, systems, computers, programs for separating a tooth from an adjacent structure, such as a gingival, by defining a cutting

surface, and applying the cutting surface between the tooth and the structure to separate the tooth (e.g., in a single cut). Application page 2, lines 15-17.

Independent claim 1 is directed to a computer-implemented method for separating gingiva (300) from a tooth (301) on a computer model of the gingiva (300) and the tooth (301). The method includes defining a closed cutting surface (302) passing through a line (304) between the gingiva (300) and a crown of the tooth (upper part of 301), wherein the closed cutting surface (302) comprises a crown portion (308) surrounding the crown of the tooth (301) and a root portion (e.g., 306) approximating the shape of the root of the tooth (bottom part of 301), and wherein the crown portion (308) of the closed cutting surface (302) comprises a volume greater than the volume of the crown of the tooth (301); and applying the cutting surface (302) to the tooth (301) to separate the gingiva (300) from the tooth (301)(step 260). These steps are discussed in the Application, for example, at least at page 12, line 15, through page 17, line 18; page 18, line 25, through page 21, line 3; Figures 5-12 and 14.

Independent claim 21 is directed to a system for separating gingiva (300) from a tooth (301) on a computer model of the gingiva (300)and the tooth (301). The system includes a means for defining a closed cutting surface (302) passing through a line (304) between the gingival (300) and a crown of the tooth (301), wherein the closed cutting surface (302) comprises a crown portion (308) surrounding the crown of the tooth (301) and a root portion approximating the shape of a root of the tooth (301), and wherein the crown portion (308) of the closed cutting surface (302) comprises a volume greater than the volume of the crown of the tooth (301); and means for applying the cutting surface (302) to the tooth (301) to separate the gingiva (300) from the tooth (301). These elements are discussed in the Application, for example, at least at page 12, line 15, through page 17, line 18; page 18, line 25, through page 21, line 3; Figures 5-12 and 14.

Independent claim 22 is directed to a computer program, residing on a tangible storage medium (406), for use in separating gingiva (300) from a computer model of a tooth (301). The program includes executable instructions operable to cause a computer (400) to:

define a closed cutting surface (302) passing through a line (304) between the gingiva (300) and a crown of the tooth(301), wherein the closed cutting surface (302) comprises a crown portion (308) surrounding the crown of the tooth (301) and a root portion (306) approximating the shape of a root of the tooth (301), and wherein the crown portion (308) of the closed cutting surface (302) comprises a volume greater than the volume of the crown of the tooth (301); and apply the cutting surface (302) to the tooth (301) to separate the gingiva (300) from the tooth (301) in a single cut. These elements are discussed in the Application, for example, at least at page 12, line 15, through page 17, line 18; page 18, line 25, through page 21, line 3; Figures 5-12 and 14.

Independent claim 23 is directed to a computer program, residing on a tangible storage medium (406), for use in separating gingiva (300) from a computer model of a tooth (301). The program comprising executable instructions operable to cause a computer (400) to: define a closed cutting surface (302) passing through a line (304) between the gingiva (300) and a crown of the tooth (301), wherein the closed cutting surface (302) comprises a crown portion (308) surrounding the crown of the tooth (301) and a root portion (306) approximating the shape of a root of the tooth (301), and wherein the cutting surface (302) is expressed as a spline function and a quadratic function, the crown portion (308) of the closed cutting surface (302) comprising a volume greater than the volume of the crown of the tooth (301); and apply the cutting surface (302) to the tooth (301) to separate the gingiva (300) from the tooth (301) in a single cut. These elements are discussed in the Application, for example, at least at page 12, line 15, through page 17, line 18; page 18, line 25, through page 21, line 3; Figures 5-12 and 14.

Independent claim 24 is directed to a computer (400), comprising: a processor (402); a data storage device (406) coupled to the processor (402), the data storage device (406) containing a computer program for use in separating gingival (300) from a computer model of a tooth (301). The program comprising executable instructions operable to cause a computer (400) to: define a closed cutting surface (302) passing through a line (304) between the gingiva (300) and a crown of the tooth (301), wherein the closed cutting surface (302) comprises a crown portion (308) surrounding the crown of the tooth (301) and a root portion (306) approximating the shape of a root of the tooth (301), and wherein the cutting surface (302) is expressed as a

spline function and a quadratic function, and wherein the cutting surface (302) further comprises a plurality of surfaces, and wherein a root of the tooth (301) is modeled as a parabolic surface below a gingival line(304), the crown portion (308) of the closed cutting surface comprising a volume greater than the volume of the crown of the tooth (301); and apply the cutting surface (302) to the tooth to separate the gingiva (300) from the tooth (301). These elements are discussed in the Application, for example, at least at page 12, line 15, through page 17, line 18; page 18, line 25, through page 21, line 3; Figures 5-12 and 14.

Independent claim 26 is directed to a computer-implemented method for separating tooth (301) from gingival (300). The method includes defining a closed cutting surface (302) passing through a line (304) between the gingiva (300) and a crown of the tooth (301), wherein the closed cutting surface (302) comprises a crown portion (308) surrounding the crown of the tooth (301) and a root portion (306) approximating the shape of a root of the tooth (301), and wherein the crown portion (308) of the closed cutting surface (302) comprises a volume greater than the volume of the crown of the tooth (301); and applying the cutting surface (302) to the tooth (301) to separate the gingiva (300) and reconstruct the root for the tooth (301). These steps are discussed in the Application, for example, at least at page 12, line 15, through page 17, line 18; page 18, line 25, through page 21, line 3; Figures 5-12 and 14.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-31 are unpatentable under 35 U.S.C. § 102(e) over U.S. Patent No. 6,409,504 to Jones et al.

7. ARGUMENT

I. Whether claims 1-31 are unpatentable under 35 U.S.C. § 102(e) over U.S. Patent No. 6,409,504 to Jones et al.

In the Advisory Action mailed 12/5/2006, the rejections of claims 1-31 as allegedly being unpatentable under 35 U.S.C. § 102(e) over Jones et al. were maintained.

Appellants believe that pending claims 1-31 include elements not taught or suggested by Jones, and as such respectfully traverse this rejection for at least the reasons discussed below.

The present rejection does not establish *prima facie* anticipation under 35 U.S.C. § 102(b) and M.P.E.P. § 2131. A claim is only anticipated if each and every element as set forth in the claim is found within a single prior art reference. M.P.E.P. § 2131; *Verdegaal Bros. v. Union Oil Co. of California,* 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The Court of Appeals for the Federal Circuit has held that the identical invention must be shown in as complete detail as is contained in the ... claim. M.P.E.P. § 2131; *Richardson v. Suzuki Motor Co.,* 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

If an element is not expressly described in a cited reference, then the Examiner must provide rationale or evidence tending to show inherency. M.P.E.P. § 2112. To establish inherency, the evidence must make clear that the missing descriptive matter is necessarily present in the cited reference, and that it would be so recognized by persons of ordinary skill. In particular, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. M.P.E.P. § 2112; *Ex parte Levy,* 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. M.P.E.P. § 2112; *In re Rijchaert,* 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

Appellants respectfully submit that a *prima facie* case of anticipation has not been established because the cited art reference of Jones fails to expressly or inherently teach the present invention defined by the claims. In the interest of administrative economy and efficiency, Appellants present their position as a single group, using claim 1. Independent claim 1 reads as follows:

> A computer-implemented method for separating gingiva from a tooth on a computer model of the gingiva and the tooth, the method comprising:
>
> defining a closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface

comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of the root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

applying the cutting surface to the tooth to separate the gingiva from the tooth.

(Emphasis added)

Applicants respectfully submit that Jones fails to teach each and every element of the currently claimed invention, thereby precluding a finding of anticipation under 35 U.S.C. §102(e). In particular, Jones at a minimum fails to teach defining a closed cutting surface, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of the root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth. These elements, which are missing from Jones, are recited in independent claims 1, 21-24, and 26, and incorporated into corresponding dependent claims 2-20, 25, and 27-31. Moreover, these elements are supported throughout the specification (see, e.g., Figures 6, 8B, 11, and 12). Attention is respectfully drawn, for example, to the exemplary embodiment illustrated Figure 6 and the corresponding discussion in the detailed description at page 13, paragraph [0065], which illustrates a cutter shaped like a sort of "ice-cream cone", with the top surrounding the crown of a tooth to be extracted, and the bottom embedded inside the gingival to define the tooth root portion of the closed cutting surface. These elements recited in the current claims are not taught or suggested by Jones.

Jones teaches computer automated techniques for subdividing, or segmenting, a digital dentition model into models of individual dentition components. While the teachings of Jones might be considered similar to the currently claimed methods in the general sense that both Jones and the present invention are directed to separating dentition components, Jones fails to teach or suggest the specific techniques described in the present specification and currently claimed.

The Examiner has repeatedly cited to the following provisions of Jones in rejecting the current claims as being anticipated: col. 14, lines 45-58; col. 15, lines 12-26; claim

25; and figures 35A-35F. Jones teaches displaying an image of a dentition model and identifying features of individual teeth (e.g., gum line or gingival margin), and then cutting along an identified feature in order to separate components of the tooth, but Jones does not teach defining a closed cutting surface as recited in claim 1. Referring to Figs. 35A-35F, Jones teaches a dentition model with an identified crown 602, gingival tissue 604, gingival gum line 600, and modeled tooth root surface 618. Jones teaches separating dentition components by first identifying the gingival line and modeling the tooth root including a cutting surface, and using the created surface as a cutting surface to separate the tooth from the gingival tissue (see, e.g., Jones at Figs. 35A-35F; col. 14, lines 55-58; col. 15, lines 20-26).

Thus, while Jones appears to teach a tooth model having identified features such as a crown, gum line, and a modeled root, and then directly cutting along an identified feature, Jones does not teach defining a closed cutting surface that is separate or at least partially distinct from the tooth model. In particular, Jones fails to teach or suggest defining a closed cutting surface that comprises a crown portion surrounding the crown of the tooth in addition to a root portion approximating the shape of the root of the tooth, with the crown portion of the closed cutting surface having a volume greater than the crown of the tooth itself, as recited in claim 1.

In response to Appellants' comments regarding the failure of Jones to teach each and every element of claim 1, including the crown portion of the closed cutting surface having a volume greater than the crown of the tooth itself, the Examiner has argued that these elements are inherently taught by Jones. In particular, the Examiner stated that the cutting surface of Jones must inherently be slightly larger in volume than the crown of the tooth in order to enclose and surround the tooth (Advisory Action, mailed 12/5/2006). Appellants respectfully disagree and respectfully submit that the Examiner's position lacks support in Jones. As discussed above, Jones teaches identifying a gingival margin or tooth/gum line 600 in a dentition model and cutting along that line (see, e.g., Figs 35A-35F of Jones). Jones simply does not teach defining a closed cutting surface (e.g., distinct from the tooth model itself) including a crown portion surrounding the crown of the tooth and having a volume greater than the volume of the crown of the tooth itself.

As set forth above, inherency may not be established by probabilities or possibilities, the allegedly inherent characteristic necessarily flows from the teachings of the cited reference. M.P.E.P. § 2112; *In re Rijchaert*. Anticipation by inherency has not been established in the present case. The mere fact that Jones separates a model tooth from model gingival tissue falls far short of providing the specific method, as disclosed in the present specification and defined by the current claims, of separating gingival from a tooth on a computer model of the gingiva and the tooth, including each and every element as recited in claim 1.

For the reasons set forth above, the Examiner has not established *prima facie* anticipation. Jones does not teach, either expressly or inherently, each and every element of independent claims 1, 21-24, and 26, and incorporated into corresponding dependent claims 2-20, 25, and 27-31. Accordingly, the rejection of claims 1-31 under 35 U.S.C. § 102(e) should be reversed and the claims allowed.

8. CONCLUSION

For these reasons, it is respectfully submitted that the rejection should be reversed.

Respectfully submitted,

Date: 4/16/2007 By: _____

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9. CLAIMS APPENDIX

1. (Previously presented) A computer-implemented method for separating gingiva from a tooth on a computer model of the gingiva and the tooth, the method comprising:

defining a closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of the root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

applying the cutting surface to the tooth to separate the gingiva from the tooth.

2. (Original) The method of claim 1, wherein the cutting surface is curved.

3. (Original) The method of claim 1, wherein the cutting surface is expressed as a function.

4. (Original) The method of claim 1, wherein the cutting surface is expressed as a spline function and a quadratic function.

5. (Original) The method of claim 1, wherein the cutting surface is expressed as a spline function and a parabolic function.

6. (Original) The method of claim 1, wherein the cutting surface is interactively adjusted.

7. (Original) The method of claim 4, wherein the interactive adjustment of the cutting surface modifies a function defining the cutting surface.

8. (Previously presented) The method of claim 4, further comprising interactively highlighting the separated gingiva.

9. (Previously presented) The method of claim 8, further comprising interactively highlighting a border of the separated gingiva.

10. (Original) The method of claim 1, wherein the cutting surface is defined by specifying a basis for the tooth.

11. (Original) The method of claim 1, further comprising finding a gingival line separating a tooth surface and a gingiva.

12. (Original) The method of claim 11, further comprising finding the high curvature location on the tooth surface.

13. (Original) The method of claim 11, further comprising fitting a spline to the gingival line.

14. (Original) The method of claim 1, wherein the cutting surface further comprises a plurality of surfaces.

15. (Original) The method of claim 14, wherein the root of the tooth is modeled as a parabolic surface below a gingival line.

16. (Original) The method of claim 14, further comprising defining an enclosing surface to enclose the crown of the tooth.

17. (Previously presented) The method of claim 14, further comprising:
displaying the cutting surface specified with a plurality of nodes;
adjusting one or more nodes to modify the surface; and
applying the surface to separate the gingiva from the tooth.

18. (Original) The method of claim 17, further comprising providing a handle to adjust each orientation of the cutting shape.

19. (Original) The method of claim 17, wherein adjusting one or more nodes further comprises moving one or more nodes.

20. (Original) The method of claim 17, wherein the cutting surface is formed using a function in a cylindrical coordinate system.

21. (Previously presented) A system for separating gingiva from a tooth on a computer model of the gingiva and the tooth, the system comprising:

means for defining a closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

means for applying the cutting surface to the tooth to separate the gingiva from the tooth.

22. (Previously presented) A computer program, residing on a tangible storage medium, for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth in a single cut.

23. (Previously presented) A computer program, residing on a tangible storage medium, for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the cutting surface is expressed as a spline function and a quadratic function, the crown portion of the closed cutting surface comprising a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth in a single cut.

24. (Previously presented) A computer, comprising:

a processor;

a data storage device coupled to the processor, the data storage device containing a computer program for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the cutting surface is expressed as a spline function and a quadratic function, and wherein the cutting surface further comprises a plurality of surfaces, and wherein a root of the tooth is modeled as a parabolic surface below a gingival line, the crown portion of the closed cutting surface comprising a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth.

25. (Original) The system of claim 24, further comprising instructions to define an enclosing surface to enclose the crown of the tooth.

26. (Previously presented) A computer-implemented method for separating tooth from gingiva, comprising:

defining a closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

applying the cutting surface to the tooth to separate the gingiva and reconstruct the root for the tooth.

27. (Previously presented) The method of claim 1, further comprising:

visually displaying the cutting surface to a user as two surfaces representing opposed sides of the separation between the gingival and the tooth; and

allowing the user to determine whether to separate the gingival from the tooth.

28. (Previously presented) The method of claim 1, wherein the crown surface is modeled as a one or more functions.

29. (Previously presented) The method of claim 28, wherein the crown surface is modeled as a quadratic function in polar coordinates.

30. (Previously presented) The method of claim 1, further comprising allowing a user to change a shape of the crown surface.

31. (Previously presented) The method of claim 30, wherein allowing the user to change the shape comprises allowing the user to move at least one of crown control points, top control points and a gingival line.

32-36. (Canceled).

10. EVIDENCE APPENDIX

None.

11. RELATED PROCEEDINGS APPENDIX

None.